SVKM's
D. J. Sanghvi College of Engineering

Program: B.Tech in Mechanical Engineering **Academic Year: 2022** **Duration: 3 hours**
Date: 11.01.2023
Time: 10:30 am to 01:30 pm
Subject: Production Planning and Control (Semester VII) **Marks: 75**

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover page of the Answer Book, which is provided for their use.
(1) This question paper contains three pages.
(2) All Questions are Compulsory.
(3) All questions carry equal marks.
(4) Answer to each new question is to be started on a fresh page.
(5) Figures in the brackets on the right indicate full marks.
(6) Assume suitable data wherever required, but justify it.
(7) Draw the neat labelled diagrams, wherever necessary.

<table>
<tr><th>Question No.</th><th></th><th>Max. Marks</th></tr>
<tr><td>Q1 (a)</td><td>What are the factors influencing the production planning and control?
OR
Explain with examples various types of Production Systems.</td><td>[10]</td></tr>
<tr><td>Q1 (b)</td><td>List and elaborate the Prerequisites of PPC.</td><td>[05]</td></tr>
<tr><td>Q2</td><td>Forecasts of the expected demand of a product for the next six months and the production days available during these months of planning horizon are given. Also, the costs associated with various production factors are shown. Find the production costs under the following strategies. (a) Constant workforce level and carrying the inventory (b) Subcontracting as a strategy to meet the fluctuating demand (c) Overtime as a strategy to meet the fluctuating demand (d) Hiring and firing as a strategy to meet the fluctuating demand. Compare and suggest the optimal strategy.
<table>
<tr><th colspan="3">Product demand & available production days</th></tr>
<tr><td>Month</td><td>Expected demands</td><td>Production days</td></tr>
<tr><td>Jan</td><td>1000</td><td>20</td></tr>
<tr><td>Feb</td><td>800</td><td>13</td></tr>
<tr><td>Mar</td><td>900</td><td>19</td></tr>
<tr><td>Apr</td><td>1200</td><td>23</td></tr>
<tr><td>May</td><td>1000</td><td>20</td></tr>
<tr><td>June</td><td>1400</td><td>18</td></tr>
<tr><td></td><td>~~7300~~ 6300</td><td>113</td></tr>
</table>
</td><td>[15]</td></tr>
</table>

Various costs involved in production	
Inventory carrying cost	Rs 5 per unit per month
Subcontracting cost per unit	Rs 8 per unit
Average pay rate	Rs 5 per hour (Rs 40 per day)
Overtime pay rate	Rs 10 per hour (above 8 hours per day)
Labour hours to produce a unit	2 hours per unit
Cost of increasing daily production rate (hiring & training)	Rs 300 per unit
Cost of decreasing daily production rate (layoffs)	Rs 500 per unit

Q3 (a) [10]

Compute the sequence that minimises the total elapsed time (in hours) required to complete the following jobs on three machines Ml, M2 and M3 in the order Ml, M2, M3.

Machines	Jobs				
	A	B	C	D	E
M1	5	7	6	9	5
M2	2	1	4	5	3
M3	3	7	5	6	7

OR

A particular item has a demand of 9,000 units per year. The cost of one procurement is Rs. 100/- and the holding cost per unit is Rs. 2.40 per year. The replacement is instantaneous and no shortages are allowed. Determine: (a) Economic lot size, (b) The number of orders per year, (c) The time between orders, and (d) the total cost per year if the cost of one units is Re.1/-.

Q3 (b) What is the purpose of keeping safety stocks? [05]

Q4 (a) Calculate the minimum time taken for the two jobs on four machines given below. [05]

JOB 1	ORDER	A	B	C	D
	TIME	2	3	3	4
JOB 2	ORDER	D	B	A	C
	TIME	2	3	3	4

<table>
<tr><td></td><td></td><td></td></tr>
<tr><td>Q4 (b)</td><td>With the help of the activities given, draw a network. Determine its critical path, earliest start time, earliest finish time, latest start time, latest finish time, total float, free float and independent float.
<table>
<tr><th>Activity</th><th>Duration (days)</th></tr>
<tr><td>1-2</td><td>4</td></tr>
<tr><td>1-3</td><td>12</td></tr>
<tr><td>1-4</td><td>10</td></tr>
<tr><td>2-4</td><td>8</td></tr>
<tr><td>2-5</td><td>6</td></tr>
<tr><td>3-6</td><td>8</td></tr>
<tr><td>4-6</td><td>10</td></tr>
<tr><td>5-7</td><td>10</td></tr>
<tr><td>6-7</td><td>0</td></tr>
<tr><td>6-8</td><td>8</td></tr>
<tr><td>7-8</td><td>10</td></tr>
<tr><td>8-9</td><td>6</td></tr>
</table>
OR
Find optimal order quantity for a product for which prices discounts are as:
<table>
<tr><th>Order quantity</th><th>Unit price (Rs.)</th></tr>
<tr><td>0 < Q < 500</td><td>10.00</td></tr>
<tr><td>500 <= Q < 750</td><td>9.25</td></tr>
<tr><td>750 <= Q</td><td>8.75</td></tr>
</table>
Monthly demand for product is 200 units, storage cost is 2% of unit cost and cost of ordering is Rs. 100.</td><td>[10]</td></tr>
<tr><td>Q5 (a)</td><td>Write short note on PERT.</td><td>[05]</td></tr>
<tr><td>Q5 (b)</td><td>Write a short note on Enterprise Resource Planning (ERP). List the challenges and benefits of ERP.</td><td>[10]</td></tr>
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